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SURVIVAL OF USABLE STANDS OF FALL-SOWN OATS IN DIFFERENT GEOGRAPHIC AREAS

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SURVIVAL OF USABLE STANDS OF FALL-SOWN OATS IN DIFFERENT GEOGRAPHIC AREAS [1/]

By Franklin A. Coffman [2/]

Winterkilling is one of the chief hazards in growing fall-sown oats, and the extent of such killing differs greatly in the different geographical areas of the United States. This is true even in those areas in which average winter temperatures are comparable.

An earlier report [3/] indicated something of this influence, but data from 1,100 additional hardiness nursery reports are now available. Many of these are from areas not included previously. A comparison has been made of the relative survivals of nine varieties when grown in the different areas. These include representatives of the different morphologic types, as well as the different hardiness levels found among winter oats. Morphologic descriptions and the histories of these oats have been published. [4/]

Experiments Conducted

This study, started in 1926, had been conducted for 36 years in 1962. Data have been received for 1 to 36 years from each of 114 points in 29 States of the United States and from 5 points in 2 Provinces in Canada. These 119 stations are located in 10 geographic areas and 7 winter (Dec.-Feb.) temperature zones, as indicated in table 1 and figure 1. The average winter temperatures in the different zones, 1 to 7, are successively 50°, 45°-50°, 40°-45°, 35°-40°, 30°-35°, 25°-30°, and 25° F., respectively.

Seven varieties, Hairy Culberson, Pentagon, Tech, Winter Turf, Lee, Fulghum, and Appler--C.I. [5/] No's. 2505, 2499, 974, 3296, 2042, 708, and 1815, respectively--were grown in all years, and two varieties, Fulwin and Wintok--C.I. No's. 3168 and 3424, respectively--were grown for shorter periods.

1/ Crops Research Division, Agricultural Research Service, U.S. Department, in cooperation with the State agricultural experiment stations listed in table 1.

2/ Formerly principal agronomist, Crops Research Division.

3/ Coffman, F. A. Survival of oats grown in winter-hardiness nurseries. U.S. Dept. Agr. Cir. 622, 35 pp. 1941.

4/ Stanton, T. R. Oat identification and classification. U.S. Dept. Agr. Tech. Bul. 1100, 206 pp. 1955.

5/ C.I. refers to accession number of Cereal Crops Research Branch, Crops Research Division, ARS.

TABLE 1.--Geographic area, State or Province, stations, locations on map, altitude, winter temperature zone (Dec.-Feb.) and number of reports received from each cooperating station growing the Uniform Winter Hardiness Oat Nursery from 1926-62, inclusive [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
I (A) New England				
Connecticut:				
Ellington	3	219	6	4
Massachusetts:				
Amherst	1	267	6	1
Feeding Hills	2	119	6	12
(B) North East				
Ontario:				
Harrow [2/]	119	---	7	2
Delaware:				
Georgetown	17	54	4	2
Newark	16	137	5	6
Maryland:				
Beltsville	18	330	4	22
College Park	19	170	4	21
New Jersey:				
New Brunswick	10	61	5	28
New York:				
Aurora	4	436	7	2
Caldwell (Ithaca)	6	836 [3/]	7	1
Ithaca	9	836	7	10
Katola (Ithaca)	7	836 [3/]	7	1
McGowan (Ithaca)	8	836 [3/]	7	1
Mt. Pleasant	5	713	7	1
Pennsylvania:				
Centre Hall	13	1,100	6	5
Clearfield	15	1,100	6	6
Lancaster	11	413	5	1
Landisville	12	405	5	5
State College	14	1,191	6	5
West Virginia:				
Kearneysville	24	589	5	3
Lakin	28	553	5	5
Morgantown	27	963	5	19

See footnotes at end of table.

TABLE 1.--Continued [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
West Virginia:				
Reedsville	26	1,817	6	7
Wardensville	25	927 [3/]	5	9
II Coastal Plains				
Alabama:				
Fairhope	75	57	1	13
Florida:				
Quincy	48	260	1	14
Georgia:				
Tifton	47	370	1	10
Louisiana:				
Baton Rouge	92	35	1	14
Bossier City	89	180	2	2
Calhoun	90	171	2	13
St. Joseph	91	76	2	6
South Carolina:				
Blacksville	39	296	2	5
Columbia	38	351	3	2
Florence	36	136	2	2
Hartsville	37	227	3	34
Texas:				
College Station	106	360	1	23
III Piedmont				
Alabama:				
Auburn	74	698	3	1
Georgia:				
Athens	45	694	3	19
Experiment	46	975	3	36
Mississippi:				
Holly Springs	76	600	3	16
State College	79	362	3	34
West Point	80	241	3	16
North Carolina:				
McCullers	30	384	3	1
Raleigh	29	376	3	5
Rowan	31	342	3	2

See footnotes at end of table.

TABLE 1.--Continued [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
North Carolina:				
Salisbury	32	760	3	4
Statesville	33	926	3	24
South Carolina:				
Chester	40	537	3	8
Clemson	42	850	4	34
Westminster	43	953	4	10
York	41	680	3	4
Virginia:				
Arlington	20	44	4	13
IV Appalachain and Ozark Mountain Valleys and Uplands				
Arkansas:				
Fayetteville (Ozarks)	87	1,451	4	35
Georgia:				
Blairsville	44	1,926	4	17
Kentucky:				
Allensville	65	579	4	4
Hopkinsville	66	521	4	6
Lebanon	64	779	4	2
Lexington	63	989	5	19
Princeton	67	455	4	6
North Carolina:				
Swannanoa	34	2,522	4	6
Waynesville	35	2,756	4	18
Pennsylvania:				
(See I-B)				
Tennessee:				
Columbia	71	656	3	5
Crossville	70	1,881	4	20
Greenville	68	1,581	4	2
Jackson	73	425	3	11
Knoxville	69	1,004	4	33
Springfield	72	595	4	1
Virginia:				
Blacksburg	22	2,100	5	26
Glade Spring	23	2,074	5	11

See footnotes at end of table.

TABLE 1.--Continued [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
Virginia:				
Staunton	21	1,380	5	10
West Virginia:				
(See I-B)				
V North Central Area				
Illinois:				
Alhambra	60	563	5	5
Brownstown	61	403 [3/]	5	8
Carbondale	62	416	5	10
Urbana	59	725	6	17
Indiana:				
Bedford	54	681	5	9
Evansville	58	431	5	2
Lafayette	53	661	6	19
Princeton	57	481	5	8
Vincennes	56	431	5	2
Worthington	55	540	5	3
Iowa:				
Ames	81	926	7	8
Missouri:				
Columbia	82	738	6	24
Perry County	83	356 [3/]	4	1
Pierce City	85	1,198	4	2
Sikeston	84	328	4	15
Ohio:				
Carpenter	51	658 [3/]	5	14
Columbus	50	824	5	12
Germantown	52	713	5	1
Wooster	49	920	6	7
VI Mississippi Valley				
Arkansas:				
Fayetteville (See IV)				
Jonesboro	86	345	3	1
Stuttgart	88	228	3	32
Illinois:				
Alhambra (See V)				

See footnotes at end of table.

TABLE 1.--Continued [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
Illinois:				
Brownstown (See V)				
Carbondale (See V)				
Louisiana:				
Baton Rouge (See II)				
St. Joseph (See II)				
Mississippi:				
Scott	77	136	3	1
Stoneville	78	122	3	33
Missouri:				
Columbia (See V)				
Perry County (See V)				
Sikeston (See V)				
VII Western Plains				
Colorado:				
Akron	107	4,560	6	4
Missouri:				
Pierce City (See V)				
Oklahoma:				
Cherokee	95	1,175	4	5
Goodwell	93	3,286	5	3
Heavener	97	561	3	2
Lawton	99	1,111	3	15
Lone Grove	98	872	3	6
Stillwater	96	870	4	29
Woodward	94	1,893	4	27
Texas:				
Amarillo	100	3,676	4	11
Bushland	101	3,825	4	9
College Station (See II)				
Denton	103	620	3	34
Greenville	104	552	2	32
Howe	102	846	3	1
Temple	105	630	2	13

See footnotes at end of table

TABLE 1.--Continued [1/]

Area, State or Province, and station	Station No. on map	Altitude	Temperature zone (Dec.-Feb.)	Reports received
		Feet		Number
VIII Northwest Coastal Area				
Canada, British Columbia				
Cobble Hill	117	200 [3/]	4	3
Duncan	116	200 [3/]	4	2
Nanaimo	115	200 [3/]	4	1
Saanichton	118	200 [3/]	4	7
Oregon:				
Astoria	112	20	4	5
Corvallis	113	319	4	6
Washington:				
Battle Ground	111	100 [3/]	4	3
Mount Vernon	109	23	4	3
Puyallup	110	49	4	5
IX Northwest Drylands				
Oregon:				
Moro	114	200	5	11
Washington:				
Pullman	108	2,550	5	4

1/ Cooperators located at the different stations have been listed in two previous publications "Winter survival of fall sown oats: Summary data obtained in Uniform Hardiness Nurseries from 1926-62, inclusive," ARS 34-65, 20 pp., July 1964; and "Factors influencing winter survival in winter oats." [In press].

2/ Survival at Harrow was "0" for all entries in all years.

3/ Approximate: Based on nearby point.

Figure 1.--Geographic areas (Roman numerals), zone areas for winter oat studies, and station location numbers for stations listed in table 1.

Results Obtained on Varieties

Survival data indicate that all entries survived 100 percent in all years at 6 points, whereas all were killed 100 percent in all years at 4 points. Of the 1,249 reports received, killing was complete in 95 nurseries, all entries survived 100 percent in 287 nurseries, and killing was of a differential nature in 867 nurseries.

It is generally considered that a survival of 50 percent or more of winter oats is a usable stand or sufficient to produce a crop, later seasonal weather conditions being average to favorable. If killing exceeds 50 percent, the oats might well be plowed up, and the soil used for another crop. Consequently, data presented are on the basis of percentage of survival equaling 50 percent or more. From the economic standpoint, the survival of a usable stand is the important consideration.

Without reference to geographic area or temperature zone in which the nurseries were grown, summary results for 1,249 nurseries and for each of the 9 varieties grown are included in table 2.

Results from Geographic Areas

Data have been assembled in tables 3 to 5 on different geographic areas that include New England, Northeastern States, Atlantic and Gulf Coastal Plains, the Piedmont, Appalachain and Ozark Mountain valleys and uplands, Mississippi valley, North Central Area, western Plains, Northwest drylands, and northwestern coastal area.

It should be mentioned that data were obtained from five points in Canada, one in the east and four in Southwestern Canada, or Puget Sound area. Reports from the eastern point are discussed with data from Northeastern United States. This one station is located across Lake Erie from New York State. Data from the Puget Sound area of Western Canada are discussed with those from western Washington and Oregon or with the northwestern coastal area of the United States.

A few cases exist in which certain stations can be assigned to more than one geographic area because some geographic areas overlap. An example is the stations in the lower Mississippi Valley area that are at the same time in the Atlantic and Gulf coastal area. These difficulties are mentioned in discussing individual areas.

New England: Data were received from one station in Connecticut and two from Massachusetts. All stations were located in temperature zone 6. Although very far north, the influence of the Atlantic Ocean apparently tempers the winter climate in the area and oats survive much better there than in more inland areas that are not so far north. Even so, killing of

TABLE 2.--Survival of usable stands (50 percent +) of the different varieties included in Uniform Winter Hardiness Nurseries, 1926-62 [1/]

Variety	Survivals in nurseries: 50 to 100 percent	Survivals in nurseries: 0 to 49.9 percent	Usable stands
	Number	Number	Percent
Wintok	874	201	81.3
Fulwin	842	233	78.3
Hairy Culberson	929	320	74.4
Pentagon	929	320	74.4
Tech	915	334	73.3
Winter Turf (check)[2/]	881	368	70.5
Lee	867	382	69.4
Fulghum	752	497	60.2
Appler	730	519	58.5

1/ Fulwin was included during the period 1936-62, and data on Wintok, because of mixed or limited seed supplies, are not available for 1937 and 1945. Hence, the survival data for Hairy Culberson, a parent of Wintok, was substituted for those years. On the basis of comparable data on Wintok and Hairy Culberson, the percentage of usable stands for Wintok are presumably about 0.5 percent low.

2/ Comparable data on Winter Turf (check) for the years in which data on Fulwin and Wintok are shown were: survival 50-100 percent, 769; 0-49.9 percent, 306; and percentage of usable stands 70.6 percent.

less hardy oats was almost complete, and the most hardy oats were severely injured. Hence, until still more hardy oats than Wintok become available, winter oats have little promise for New England.

Northeastern Region: Data were received from 24 points in 8 States in the northeastern region as follows: Massachusetts 2, Connecticut 1, New York 6, Pennsylvania 5, New Jersey 1, Delaware 2, Maryland 2, and West Virginia 5.

Data from Harrow, Ontario, located across Lake Erie from western New York, were included with those from the northeastern geographic region. Data from the two points in Massachusetts and one in Connecticut, included in the subsection of New England, have also been included with those from the northeastern geographic region.

Atlantic and Gulf Coastal Plains Area: The exact line of separation between the Coastal Plains and Piedmont areas is not clearly defined. Also, the northern border of this geographic area is not entirely clear. The highest altitude of any station reporting data in the Coastal area was Tifton, Ga., 370 feet. The station farthest north was Hartsville, S. C., and the most westerly point was College Station, Tex. Several stations in Mississippi are at very low elevations but are located sufficiently far north and inland so that cooler temperatures prevail there than on those in the Coastal Plains.

No stations located in the Coastal Plains area of Maryland, Virginia, or North Carolina cooperated in this study. Data were received from four stations in South Carolina, four in Louisiana, and one each in Georgia, Alabama, Florida, and Texas. Stations in Mississippi have been omitted from the Coastal Plains in this summary for the reasons stated.

Piedmont Area: The so-called Piedmont or "foothill" area is located between the Coastal Plains and the Appalachain Mountains or ranges in elevation from about 400 up to slightly over 1,000 feet. Above that altitude the mountainous area begins.

In this report data from stations at altitudes above 600 feet are considered in the Upper Piedmont, and those from stations with altitudes above 1,800 feet are considered as from mountain stations. Only a rather slight difference in survival of the more hardy oats in two areas was observed, but a decided difference was observed among the less hardy ones, which killed severely at the higher altitudes. Stations in the Piedmont reporting data were located as follows: Virginia 1, North Carolina 5, South Carolina 4, Georgia 2, Alabama 1, and Mississippi 3.

In this summary, data from Stoneville and Scott in Mississippi are omitted from the Piedmont area and considered in the Mississippi Valley. Although altitudes are low, temperatures at those points are cooler than in the Piedmont generally.

The location of Arlington, Va., in this area can be questioned. However, geographically, Arlington cannot be included in the South Atlantic and Coastal Plains nor in the eastern mountain area, nor can Virginia be included among the States of northeastern United States. From the temperature viewpoint Arlington is included in zone 4, along with Clemson, S. C. Winterkilling at Arlington in 13 years was similar to that of Clemson in 34 years. Arlington averages were lower than overall averages for zone 4.

Appalachain and Ozark Mountain Valleys and Uplands: On the average the altitude in this area exceeds that of the Piedmont, although some stations, located between the mountain ranges, are at altitudes below 400 feet. Others in the mountain valleys or plateaus are above 2,500 feet. In general, located farther inland, ocean air currents have less influence and winter temperatures are lower to much lower for these stations than in areas to the east and south nearer the coast.

Only one station in the Ozarks is included. The warmest temperature zone in this region is zone 3, whereas the coolest is zone 6. States and stations included in this area were five each in Pennsylvania, Kentucky, and West Virginia, six in Tennessee, three in Virginia, two in North Carolina, and one each in Georgia and Arkansas.

The data from zone 3 in this region are similar to those from zone 3 of the Piedmont and Coastal Plains areas. Zones 4, 5, and 6 show progressively more serious winterkilling as one goes northward, as well as to higher altitudes.

North Central States Area: The North Central States Area extends from the low flood plains along the Mississippi River in Missouri on northward to the Canadian border and from the rough or rolling area of eastern Ohio westward to the dry areas of North Dakota, South Dakota, Nebraska, and Kansas. Oats are rarely fall-sown in this area, except in the more southern sections. Data from points in five States are as follows: Ohio 4, Indiana 6, Illinois 4, Iowa 1, and Missouri 4. Stations are located in temperature zones 4, 5, 6, and 7.

Mississippi Valley Area: If we include all areas drained by the Mississippi River, this geographic area would actually include nearly the entire central part of the United States. For purposes of this study data are included from only those stations located relatively close to the Mississippi River and its main tributaries. Columbia, Mo., is located in this area, whereas Pierce City, Mo., located in the high altitude, low precipitation area of southwestern Missouri, has been included in the Plains area in this summary report.

Stations in the Mississippi Valley are located in all temperature zones 1 to 6, inclusive. South to north, four stations are located in

Louisiana, two in Mississippi, two in Arkansas, three in Missouri, and three in Illinois. As would be expected, the survival of winter oats is progressively lower as one proceeds from the south northward.

Western Plains Area: In this area the cooperating stations are located in each temperature zone, 1 to 6, inclusive. Stations were located as follows: Texas 7, Oklahoma 7, Missouri 1, and Colorado 1. This geographic area differs from others located east of the Rockies in the United States in that oats winterkill severely in very temperature zone, even zone 1. This indicates clearly that low winter moisture supply has a profound influence on the survival of oats. Here, as in no other geographic area previously discussed, hardiness is important. Yet for decades, the "Red Rustproof" or oats of the "Red Texas" type have been grown, where they are severely injured even at relatively favorable winter temperatures. The superior hardiness of Wintok produced in Oklahoma is most evident in the western Plains area. This area provides a real test of hardiness in winter oats. The comparatively low annual winter moisture and frequent occurrence of dessicating winds evidently severely test the hardiness of oats.

Northwest Coastal Area: In Northwestern United States two decidedly different cropping areas exist. Along the Pacific coast moisture usually is ample, if not excessive. Because of the influence of the Pacific Ocean, winter temperatures in the coastal area are moderate.

As killing was no more severe in the Puget Sound area of British Columbia than in the coastal area of Washington and Oregon, data from four stations in Canada were included in one summary, together with those from three stations in Washington and two in Oregon.

Northwest Drylands: Data were received from one station on dryland in each Oregon and Washington. On the average, data from the area indicate adequate survivals were recorded in from only one-third to some two-thirds of the tests, depending on the variety. The coastal mountains doubtless cut off rainfall, and winter moisture conditions here are similar to those in the western Plains, whereas in coastal areas of the Northwest, the winter temperatures were only 5° higher, on the average, from those in the interior. In the coastal area only the least hardy oats are killed sufficiently to cause concern, whereas in the dryland area even the most hardy oats were killed so often and so severely as to reduce the economic prospect for winter oats in the area.

Summary of Survival in Geographic Areas

Tables 3 to 5 indicate the relative survival of the nine oat varieties when grown in different geographic areas of North America. Only the percentages of stands equal to or exceeding 50 percent are shown in these tables.

TABLE 3.--Comparison of percentages of adequate stands[1/] surviving in different geographic areas of the winter temperature zones 1 and 2 (Dec.-Feb.) of North America

Variety	Zone 1 (Dec.-Feb. 50°+ F.)			Zone 2 (Dec.-Feb.) 45°-50° F.)		
	Coastal Plains (51 reports)	Miss. Valley (14 reports)	Western Plains (23 reports)	Coastal Plains (7 reports)	Miss. Valley (21 reports)	Western Plains (45 reports)
	Percent	Percent	Percent	Percent	Percent	Percent
Wintok	100.0	100.0	100.0	100.0	100.0	93.8
Fulwin	100.0	100.0	100.0	100.0	100.0	90.6
Hairy Culberson	98.0	100.0	87.0	100.0	100.0	82.2
Pentagon	98.0	100.0	87.0	100.0	100.0	80.0
Tech	98.0	100.0	87.0	100.0	100.0	80.0
Winter Turf	98.0	100.0	87.0	100.0	100.0	77.8
Lee	98.0	100.0	87.0	100.0	100.0	77.8
Fulghum	98.0	92.9	82.6	100.0	100.0	71.1
Appler	98.0	100.0	82.6	100.0	100.0	73.3

1/ A stand of 50 percent of more was chosen as being sufficient to leave or to consider for a crop.

TABLE 4.--Comparison of percentages of adequate stands[1/] surviving in different geographic areas of the winter temperature zones 3 and 4 (Dec.-Feb.) of North America

Variety	Zone 3 (40°-45° F.) Coastal Plains (36 reports)	Piedmont (170 reports)	Mountain areas (16 reports)	Miss. Valley (67 reports)	Western Plains (58 reports)
	Percent	Percent	Percent	Percent	Percent
Wintok	100.0	96.2	100.0	96.3	93.0
Fulwin	100.0	94.7	100.0	98.2	90.7
Hairy Culberson	100.0	90.6	100.0	95.5	74.1
Pentagon	97.1	89.4	100.0	97.0	74.1
Tech	100.0	88.2	100.0	97.0	75.9
Winter Turf	100.0	88.2	100.0	94.0	70.7
Lee	100.0	87.6	100.0	94.0	70.7
Fulghum	97.1	82.9	93.8	94.0	69.0
Appler	97.1	81.2	82.3	92.5	58.6

Variety	Zone 4 (35°-40° F.) Northeast[2/] (45 reports)	Piedmont (57 reports)	S.E. Mountains (42 reports)	Mountain areas (150 reports)	Miss. Valley (16 reports)	N. central (18 reports)	Western Plains (83 reports)	Pac. Northwest[3/] (35 reports)
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Wintok	91.1	94.7	66.7	84.2	92.9	93.8	75.3	91.2
Fulwin	91.1	94.7	71.4	85.7	92.9	87.5	71.2	91.2
Hairy Culberson	88.9	89.5	61.9	78.0	75.0	77.8	66.3	91.4
Pentagon	93.3	84.2	66.7	77.3	87.5	83.3	62.8	91.4
Tech	86.7	87.7	61.9	74.7	75.0	77.8	63.9	91.4
Winter Turf	88.9	89.5	59.5	70.7	68.8	66.7	57.8	88.6
Lee	84.4	87.7	59.5	72.0	68.8	61.1	51.8	88.6
Fulghum	77.8	82.5	45.2	55.3	75.0	66.7	38.6	91.4
Appler	75.6	86.0	40.5	56.0	56.3	50.0	38.6	77.1

1/ A stand of 50 percent of more was chosen as being sufficient to leave or to consider for a crop.

2/ Arlington, Va., was included in Piedmont and was not included in the northeast. If Arlington was included in the northeast area, percentage of survival would be 5 percent less than shown.

3/ Includes stations in the Puget Sound area of British Columbia coast, as well as Washington and Oregon coastal areas.

TABLE 5.--Comparison of percentages of adequate stands[1/] surviving in different geographic areas of the winter temperature zones 5 and 6 (Dec.-Feb.) of North America

Variety	Zone 5 (30°-35° F.) Northeast (76 reports)	Applachain & Ozarks (89 reports)	Eastern Mountains (37 reports)	N. central (74 reports)	Miss. Valley (15 reports)	Western Plains (3 reports)	N.W. drylands (15 reports)
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Wintok	76.1	81.3	89.3	74.3	80.0	0	60.0
Fulwin	73.2	80.0	89.3	62.2	73.3	0	53.3
Hairy Culberson	67.1	69.7	70.3	59.5	66.7	0	53.3
Pentagon	65.8	71.9	73.0	58.1	60.0	0	60.0
Tech	68.4	71.9	67.6	58.1	60.0	0	46.7
Winter Turf	52.6	64.0	56.8	47.3	60.0	0	46.7
Lee	61.8	65.2	64.9	50.0	60.0	0	40.0
Fulghum	40.8	44.9	45.9	23.0	40.0	0	40.0
Appler	35.5	44.9	45.9	20.3	40.0	0	33.3

Variety	Zone 6 (25°-30° F.) Northeast[2/] (38 reports)	Eastern Mountains (7 reports)	N. central[2/] (67 reports)	Miss. Valley (24 reports)	Western Plains (4 reports)	New England (15 reports)
	Percent	Percent	Percent	Percent	Percent	Percent
Wintok	55.3	71.4	40.3	45.8	50.0	33.3
Fulwin	52.6	71.4	20.9	25.0	25.0	26.7
Hairy Culberson	44.7	57.1	22.4	29.2	0.0	26.7
Pentagon	47.4	57.1	20.9	25.0	0.0	33.3
Tech	39.5	71.4	17.9	20.8	25.0	20.0
Winter Turf	44.7	71.4	11.9	12.5	25.0	20.0
Lee	34.2	57.1	11.9	12.5	25.0	20.0
Fulghum	7.9	0.0	0.0	0.0	0.0	0.0
Appler	10.5	14.3	3.0	4.2	0.0	0.0

1/ A stand of 50 percent or more was chosen as being sufficient to leave or to consider for a crop.

2/ Data from zone 7 from Ames, Iowa (north central), and Ithaca, N. Y. (northeast), and vicinity indicated no oat variety survived 50 percent in 8 years of tests at Ames and in 16 station years of tests in New York. Wintok and Winter Turf survived 12.5 percent, Fulwin, Hairy Culberson, and Tech each 6.3 percent, and the other 4 varieties failed to survive 50 percent in any year.

Three geographic areas are compared in each of zones 1 and 2; five in zone 3; eight in zone 4; seven in zone 5; six in zone 6, and data appear in a footnote in table 5 for zone 7. The relative difference in survival of agronomically acceptable stands in the different geographic areas is evident.

These data indicate that, except for least hardy oats, killing seldom destroys chances of a crop in zones 1 or 2 regardless of geographic area. In zone 3 only the most hardy oats survive more than 4 years out of 5 in the western Plains, whereas in the other 4 geographic areas, survivals of all varieties are acceptable in more than 4 out 5 years. In zone 4 the differences in the survivals in the different geographic areas became more evident. Killing of all varieties in the western Plains and mountain areas of Southeastern United States is serious. Chances for survival in other areas are good.

In zone 5 the difference in survival in different areas becomes especially evident. The most hardy oats still survive 8 to 9 times out of 10 in the mountain areas but less, to very much less often, in all the other areas. This apparently indicates the influence of protective snow cover in the mountains.

In zone 6 only the most hardy oats survive as often as in 7 out of 10 times and then only in the mountain areas. Thus survivals in temperature zones 5 and 6 clearly indicate the superiority of mountain areas for winter oats over other areas. This presumably results from protective snow cover.

In zone 7 survivals are so infrequent as to be of slight interest to agriculture. Data are available from only Ames, Iowa, Ithaca and nearby points in New York, and at Harrow in Ontario, Canada.

Data on the comparative hardiness of oats in different geographic areas shown conclusively the influence of geographic location, and indicate that altitude, evident snow cover, winter moisture, and dessicating winds are potent influences on the survival of a worthwhile stand of winter oats.

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